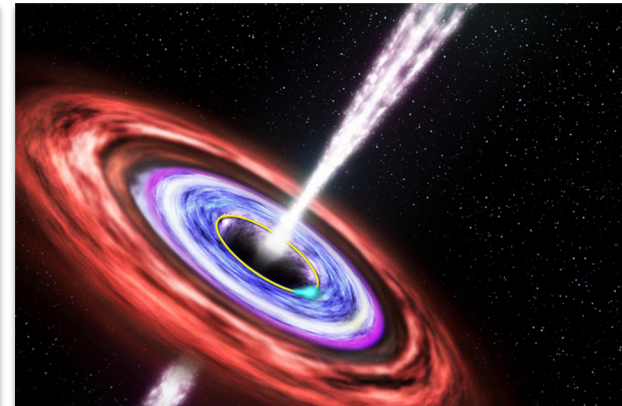
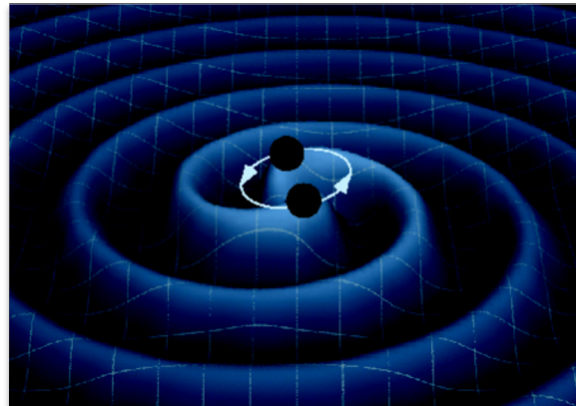
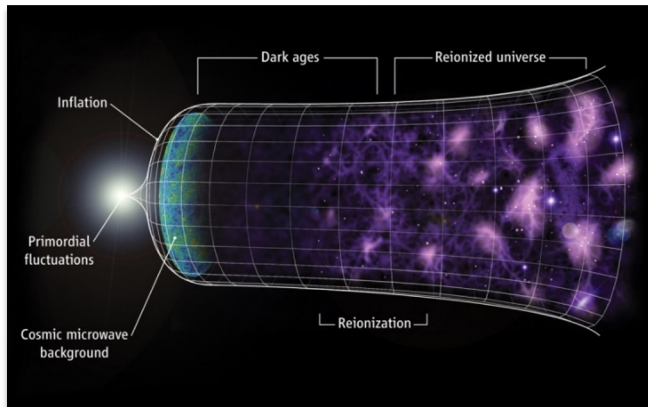


# Physics of the Cosmos

## Program Analysis Group Activities



**Graça Rocha**

Jet Propulsion Laboratory/Caltech  
*Chair Emeritus, Physics of the Cosmos Program Analysis Group, PhysPAG*  
[graca.m.rocha@jpl.nasa.gov](mailto:graca.m.rocha@jpl.nasa.gov); [graca@caltech.edu](mailto:graca@caltech.edu)

*AAS Meeting, 11<sup>th</sup> January 2021*

# Outline

---



- Introduction to **PhysPAG** (reminder)
- **PhysPAG EC** Activities and Goals
- **SIG** Highlights

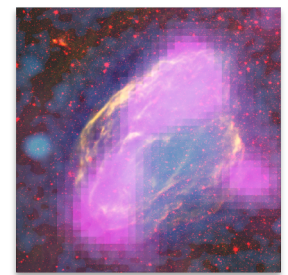
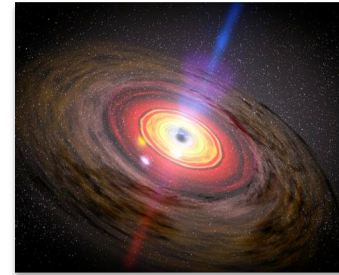
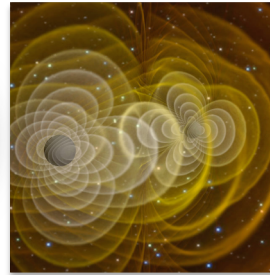
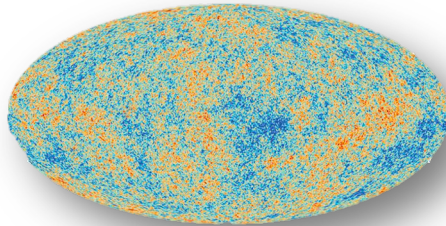
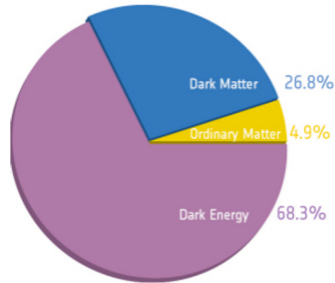
# Outline

---



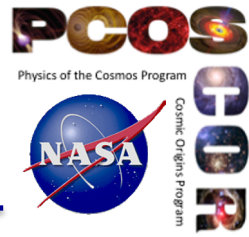
- Introduction to **PhysPAG** (reminder)
- PhysPAG EC Activities and Goals
- SIG Highlights

# Physics of the Cosmos Science Objectives

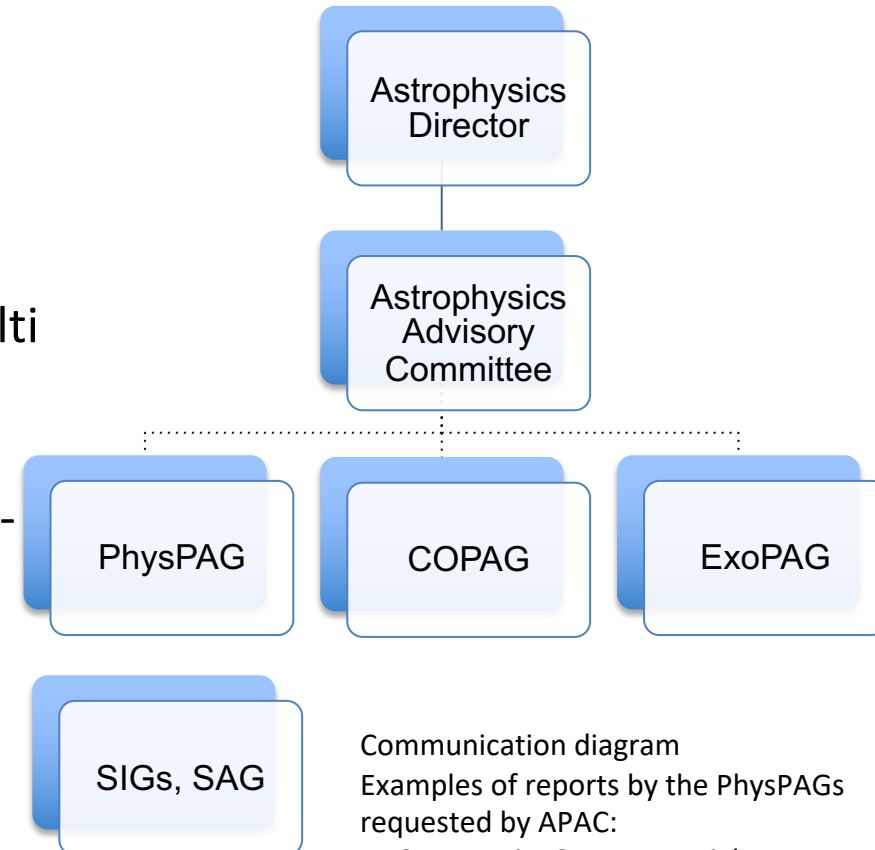


- Increase our knowledge of dark energy
- Precisely measure cosmological parameters governing evolution of the universe and test inflation hypothesis of Big Bang
- Test validity of Einstein's General Theory of Relativity and investigate nature of spacetime
- Understand formation and growth of massive black holes and their role in evolution of galaxies
- Explore behavior of matter and energy in its most extreme environments

# Communicating with NASA Astrophysics via the Program Analysis Groups (PAGs)



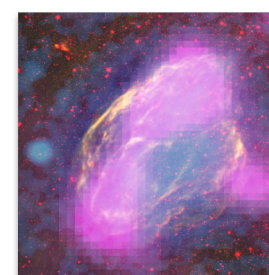
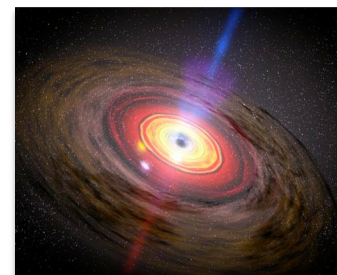
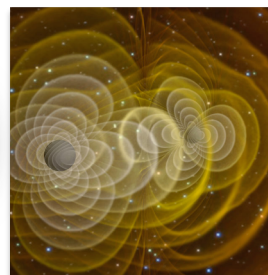
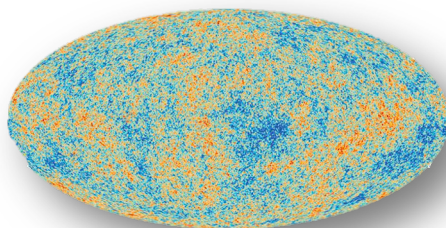
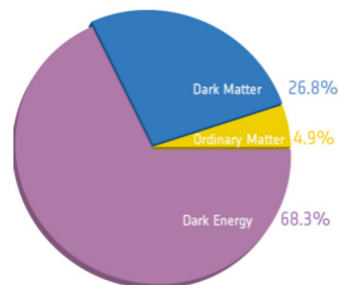
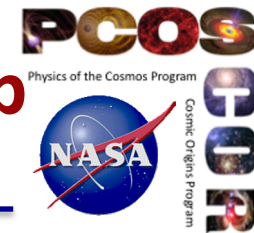
- The Physics of the Cosmos Program Analysis Group (**PhysPAG**) coordinates input and analysis from the scientific community in support of the PCOS program objectives.
- Study Analysis Groups (**SAGs**) conduct specific analyses. For example SAG on Multi Messenger Astrophysics (MMASAG)
- **Science Interest Groups (SIGs)** are longer-standing discipline fora.
  - Cosmic Ray (CR SIG)
  - Cosmic Structure (CoS SIG)
  - Gamma Ray (GR SIG)
  - Gravitational Wave (GW SIG)
  - Inflation Probe (IP SIG)
  - X-ray (XR SIG)



Communication diagram  
Examples of reports by the PhysPAGs requested by APAC:

- Community Survey on High-Impact Research Science
- Community Survey on Possible Delay in 2020 Decadal Survey

# Physics of the Cosmos Program Analysis Group



## ❑ Six Science Interest Groups (SIGs)

- Cosmic Ray (CR SIG)
- Cosmic Structure (CoS SIG)
- Gamma Ray (GR SIG)
- Gravitational Wave (GW SIG)
- Inflation Probe (IP SIG)
- X-ray (XR SIG)

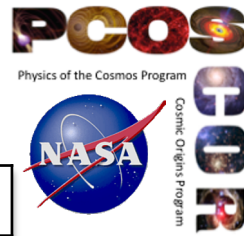
Want go get involved?

Go to:

<https://pcos.gsfc.nasa.gov/phypag/sigs-sags.php>

and subscribe to the relevant SIG emailing list

Annual call again this fall!



# PhysPAG EC Membership

| Name                         | Affiliation                  | Area of Expertise | Term Ends |
|------------------------------|------------------------------|-------------------|-----------|
| Graça Rocha (Chair Emeritus) | JPL/Caltech                  | IP SIG/CoS SIG    | Dec 2021  |
| Ryan Hickox (Chair)          | Dartmouth College            | XR SIG            | Dec 2021  |
| Grant Tremblay (Vice Chair)  | SAO                          | XR SIG            | Dec 2021  |
| Kevin Huffenberger           | Florida State Univ.          | CoS SIG/IP SIG    | Dec 2021  |
| Marcos Santander             | Univ. of Alabama             | CR SIG / GR SIG   | Dec 2021  |
| Jillian Bellovary            | Queensborough Comm Coll.     | GW SIG / XR SIG   | Dec 2022  |
| Sean McWilliams              | WVU                          | GW SIG            | Dec 2022  |
| Bindu Rani                   | SURA, GSFC                   | GR SIG            | Dec 2022  |
| Justin Finke                 | NRL                          | GR SIG            | Dec 2023  |
| Vera Gluscevic               | Univ. of Southern California | CoS SIG           | Dec 2023  |
| Andres Romero-Wolf           | JPL                          | CR SIG            | Dec 2023  |

\*New Roles

\*Term extended

\*New members as of January 2021

We thank the members rotating off in December 2020 for their service:

John Conklin, Sylvain Guiriec, James Rhoads, Abigail Vieregg and Nicolas Yunes

# Outline

---



- Introduction to PhysPAG (reminder)
- **PhysPAG EC** Activities and Goals
- SIG Highlights

# PhysPAG EC activities

---

□ **Monthly Telecons** to discuss goals and plans of action such as:

- Addressing suggestions from APAC meetings
  - Cross-PAG activities and coordination
- Improve access for (researchers at) under-served institutions
- Assess Usability/Accessibility of data analysis tools and data representation

*These discussions have been impacted by the current crisis*

# PhysPAG EC activities - Cross-PAG activities

---

## ☐ Discuss suggestions from APAC meeting, March 2020

More formal organization for the entire day before the first day of the winter AAS meeting, including cross-PAG activities and technology development.

- PhysPAG chair contacted COPAG, EXOPAG chairs and the PCOS, COR, and ExEP Program and Chief Scientists to express the willingness to coordinate sessions and technology development at the winter AAS meeting
- After a few exchanges of emails GR organized a Webex meeting to discuss and plan this cross-PAG coordination
- The cross-PAG coordination meeting took place on 11<sup>th</sup> of Sept.

# PhysPAG EC activities - Cross-PAG activities

---

- Cross-PAG coordination telecon – we converged to three cross-PAG activities:

## 1. Cross-cutting Technology

- Joint Technology Session at winter AAS meeting with emphasis on technology development that could be cross-cutting

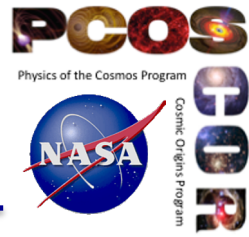
## 2. Data analysis frameworks and transferability

## 3. NASA Science at Under-Served Institutions

- Engagement in NASA astrophysics research from under-represented groups

# Cross-PAG activities

## 1. Cross-cutting Technology



### 1. Joint Technology Session with emphasis on **Technology development** that could be **cross-cutting**

- Initial preferred format: **a discussion panel** - integrated after the Joint-PAG session at the AAS meeting and in coordination with the three program offices.
- Discussion around the question **“How can we create a whole greater than the sum of the parts by exploring synergies in technology development across the Astrophysics Division?”**
- Include communication of needs and technology progress; discussion on the technology gaps in different PAGs (based on the biennial report); discussion of whether it would be useful for technology developers to include a number of different fields in their projects / SAT proposals, for example.

# Cross-PAG activities

## 1. Cross-cutting Technology

---



### ❖ Activities carried out by the PAG chairs

(Rocha, Meixner and Meyer):

- Contacted coordinators, Thai Pham for PCOS & COR and Nick Siegler for ExEP; Sarah Tuttle the chair of the technology interest group (TIG) on the COPAG and John Conklin (at the time) the PhysPAG chair Emeritus.
- ❖ Peter Kurczynski organized a follow-up meeting on 12<sup>th</sup> of November with the PAG chairs, PCOS, COR, and ExEP Program and Chief Scientists and coordinators, Thai Pham for PCOS & COR and Nick Siegler for ExEP
  - We decided to postpone the panel discussion to after the Decadal Survey outcome is known and hold a session on 'NASA Astrophysics Technology Needs' instead – delivered last Friday at the NASA Joint PAG session.

# Joint-PAG and Cross-PAG meetings

The NASA Joint-PAG session took place on 8<sup>th</sup> of January:

## NASA Joint PAG Session

Friday, 8 January 2021, 1:00–3:00 P.M.

## Agenda

- **Update on NASA Astrophysics, Q&A**

Dr. Paul Hertz, Astrophysics Division Director

- ***NASA Astrophysics Technology Needs: Plans for Factoring in the Decadal Survey's Recommendations***

Bruce T. Pham, PCOS/COR Chief Technologist, NASA GSFC;  
and Nick Siegler, ExEP Chief Technologist, JPL

---

## WebEx Connection

### NASA Joint PAG Session

Friday, 8 January 2021

**Connection:** <https://jpl.webex.com/jpl/j.php?MTID=ma997a3476d2fb67a088795c2473f0650>

**Meeting ID:** 199 900 0167

If needed, the direct dial audio is 844-575-9329

# Cross-PAG activities

## 2. Data Analysis frameworks



### 2. Data analysis frameworks and transferability

- Consensus that a one-hour session was limited in utility while the creation of a SAG could be useful
- Possibility of a new Cross-PAG SAG on Data Analysis Frameworks
- However, we would like to learn more about the ongoing NASA's Data Science effort.

#### ❖ Current activities carried out by the PAG chairs

(Rocha, Meixner and Meyer):

- Contacted the current POC for the Data Science efforts at NASA HQ Patricia Knezek (Jeffrey Hayes, on leave for an year)
- Will hold a telecon to assess the usefulness or relevance of a new cross-PAG SAG on data analysis frameworks for the data science efforts at NASA HQ
  - Is there a specific analysis the PAGs could do that would be useful to NASA HQ and so help motivate a SAG?

### 3. NASA Science for Under-Served Groups

- A *Cross-PAG initiative* including EC members from PhysPAG, ExoPAG, and COPAG has been convened to address issues of **equity and inclusion in NASA astrophysics research** with a focus on groups that have been previously under-represented.
- This group has so far engaged in three productive telecons in the past months with plans for more meetings.
- Lead: Ryan Hickox, Team: Natasha Batalha, Jillian Bellovary, Janice Lee, Michael Meyer, Graça Rocha, Kim Weaver, Zaven Arzoumanian (with more contributions welcome)

# Cross-PAG activities

## 3. Nasa Science for Under-Served Groups

---



### **Motivation:**

- Among PIs *proposing* for grants, Black, Indigenous and People of Color (BIPOC) scientists are under-represented relative to the full STEM workforce (<https://www.nsf.gov/nsb/publications/2020/nsb202013.pdf>)
- Female PIs are under-represented on major projects (e.g., Explorer missions: <https://arxiv.org/pdf/1909.10314.pdf>)
- To understand and learn what challenges colleagues at traditionally under-served institutions (including some Minority Serving Institutions) face to engage in research; and
- To understand the impact of current NASA programs/opportunities such as **MUREP** - Minority University Research and Education Project (<https://www.nasa.gov/stem/murep/home/index.html>) and **MIRO** - MUREP Institutional Research Opportunity (<https://www.nasa.gov/stem/murep/projects/miro.html>)

# Cross-PAG activities

## 3. Nasa Science for Under-Served Groups

---



### *Plan:*

This Cross-PAG initiative aims to **analyze barriers to participation**, via for example through a survey of colleagues in consultation with experts in survey design and analysis.

We anticipate that this group will **prepare a charter for a SAG** in the coming months, and aims to include broad community involvement.

We have a Cross-PAG session on '[Enhancing participation of Minority Serving Institutions, MSIs, in NASA Space Science](#)' at the AAS meeting on Monday, 11<sup>th</sup> of January, 6:50 pm ET.

# Cross-PAG activities

## 3. Nasa Science for Under-Served Groups

---



### Enhancing Participation of Minority Serving Institutions in Space Science

Monday, 11 January 2021, 6:50 P.M.

#### Agenda

- **Introduction** (organizers) (5 mins)
- **Diversity, Equity, and Inclusion in Space Science: The Big Picture**  
Dara Norman, NOIRLab (15+5 mins)
- **NASA Astrophysics at an HBCU: University of the Virgin Islands**  
David Morris, UVI (15+5 mins)
- **NASA Space Science and MSIs: A Student's Perspective**  
Tenley Hutchinson-Smith, UCSC/Spelman College (15+5 mins)
- **Panel discussion** (25 mins)

# PCOS/PhysPAG session - this session

---

## PCOS Program Analysis Group (PhysPAG)

Monday, 11 January 2021, 12:00 Noon

**Chair:** Grant Tremblay

### Agenda

- **PCOS Overview** – Brian Williams (15 + 5 mins)
- **PhysPAG Overview** – Graça Rocha (15 + 5 mins)
- **X-ray Highlights** – Ryan Hickox (15 + 5 mins)
- **LISA Science Highlights** – Krista Lynne Smith (15 + 5 mins)
- **Discussion** (10 mins)

# Outline

---



- Introduction to PhysPAG (reminder)
- PhysPAG EC Activities and Goals
- **SIG** Highlights

# Science Interest Group highlights

---

- ❑ All SIGs have splinter sessions at the winter AAS meeting

## **Multi-SIG Session on the Status of Multimessenger Astrophysics (MMA) - CR / GR / GW SIGs**

Tuesday, 12 January 2021, 12:00 Noon

## **Inflation Probe SIG (IP SIG)**

Wednesday, 13 January 2021, 12:00 Noon

## **X-Ray SIG**

Wednesday, 13 January 2021, 6:50 P.M.

## **Gravitational Wave SIG**

Thursday, 14 January 2021, 12:00 Noon

## **Cosmic Structure SIG**

Thursday, 14 January 2021, 4:10 P.M.

# Multi-SIG (CR/GR/GW SIGs) session



## Multi-SIG Session on the Status of Multimessenger Astrophysics (MMA)

Tuesday, 12 January 2021, 12:00 Noon

### Agenda

- **Invited: Multimessenger Astrophysics at NASA's Goddard Space Flight Center** – Rita Sambruna (NASA GSFC) (30 min talk)
- **Gamma-rays and Gravitational Waves** – Michelle Hui (NASA MSFC) (15 min talk)
- **Gamma-rays and Neutron Star Mergers** – Imre Bartos (University of Florida) (15 min talk)
- **Future Gamma-ray Missions for MMA: BurstCube, AMEGO-X, and AMEGO** – Judy Racusin (NASA GSFC) (15 min talk)
- **AstroPix: Investigating the Potential of Silicon Pixel Sensors in the Future of Gamma-ray Astrophysics** – Isabella Brewer (University of Maryland) (15 min talk)

# Inflation Probe SIG session

---

## Inflation Probe SIG

Wednesday, 13 January 2021, 12:00 Noon

**Chair:** Kevin Huffenberger

## Agenda

- **IPSIG Overview** – Graça Rocha (15 + 5 mins)
- **PICO Overview** – Shaul Hanany (15 + 5 mins)
- **CMB-S4 Overview** – Julian Borrill (15 + 5 mins)
- **Complementarity of Space and Ground-based Experiments** – Charles Lawrence (15 + 5 mins)
- **Discussion** (10 mins)

# X-Ray SIG session



## X-Ray SIG

Wednesday, 13 January 2021, 6:50 P.M.

## Agenda

- **Science with Ongoing Explorer Missions**
  - **Gehrels/Swift** – Jamie Kennea, Penn State (20 mins)
  - **NuSTAR** – Kristin Madsen, CRESST and X-ray Astrophysics Laboratory, GSFC (20 mins)
  - **NICER** – Erin Kara, MIT (20 mins)
- **Status of Upcoming Explorer Missions**
  - **IXPE** – Martin Weisskopf, MSFC (10 mins)
  - **XRISM** – Brian Williams, GSFC (10 mins)

# Gravitational wave SIG session

---



## Gravitational Wave SIG

Thursday, 14 January 2021, 12:00 Noon

### Agenda

- **LIGO O3 Results Summary** – Evan Goetz (15 mins, 5 questions)
- **NANOGRV Results Summary** – Scott Ransom (15 mins, 5 questions)
- **LISA Overview of Science and Programmatics** – Ira Thorpe (15 mins, 5 questions)
- **BlackHoles@Home** – Zach Etienne (15 mins, 5 questions)

# Cosmic Structure SIG session



## Cosmic Structure SIG

Thursday, 14 January 2021, 4:10 P.M.

## Agenda

- **Overview of Cosmic Structure SIG** – James Rhoads, NASA/GSFC (15 mins)
- **The Interplay between Space- and Ground-Based Baryon Acoustic Oscillation Studies** – Donghui Jeong, Penn State Univ. (15 mins)
- **The ODIN Survey: Hunting for the Largest Cosmic Structures in the Distant Universe** – Kyoungsoo Lee, Purdue University (15 mins)
- **Cosmological Simulations of Galaxy Formation: A Multi-Scale Effort** – Jorge Moreno Soto, Pomona College (15 mins)
- **Discussion** (30 mins)

# PhysPAG/SIG Meetings and Activities

---

- **AAS Winter January 2021**

- PCOS & PhysPAG Town Hall – this session
- SIGS splinter sessions – All SIGs

- **APS April 2021**

- PCOS & PhysPAG Town Hall
- SIGS splinter sessions - GW SIG, CoS SIG, GR SIG, CR SIG, IP SIG